BTEC Assignment Brief

Qualification	Pearson BTEC International Level 3 Diploma in Engineering Pearson BTEC International Level 3 Diploma in Mechanical Engineering Pearson BTEC International Level 3 Diploma in Manufacturing Engineering Pearson BTEC International Level 3 Diploma in Aeronautical Engineering Pearson BTEC International Level 3 Extended Diploma in Engineering Pearson BTEC International Level 3 Extended Diploma in Electrical/Electronic Engineering Pearson BTEC International Level 3 Extended Diploma in Mechanical Engineering Pearson BTEC International Level 3 Extended Diploma in Manufacturing Engineering
Unit number and title	**Unit 26: Mechanical Behaviour of Non-metallic Materials**
Learning aim(s)	**B:** Explore safely the mechanical properties of non-metallic materials and the impact of structural defects on them.
Assignment title	Practical investigation of the mechanical properties of non-metallic materials and the impact of defects in their structure
Assessor	
Issue date	
Hand in deadline	

Vocational Scenario or Context	You are working as an apprentice technician for a large company that manufactures mechanical, structural and bodywork components for the automotive industry. It is now time for you to spend a few weeks in the quality assurance department where you will assist with quality checks on different material samples provided by a number of suppliers. You will be required to carry out destructive testing, use accredited technical data sources and research non-destructive test methods.

Task 1	You are going to explore the relationships between the mechanical properties of non-metallic materials, material defects and in service behaviour using both practical experimentation and research. The tasks are to: • Complete safely at least one type of destructive test (e.g. tensile, impact, creep, fatigue) on a series of eight prepared samples of known materials. • Determine the mechanical properties of the test samples as indicated by the test results. • Compare the results indicated in the test results with those from accredited reference data sources. • Complete research into at least two types of non-destructive test used to detect defects in non-metallic materials (e.g. dye penetration, ultrasound). • Complete research into typical non-metallic material defects and evaluate their effects on the mechanical properties of the materials. • Evaluate the relationship between the measured mechanical properties of material samples, values for these properties taken from accredited reference data, material defects and the material's in-service behaviour. **Destructive testing** You are going to carry out at least one type of destructive test on pre-prepared non-metallic material samples. **To do this:** Your tutor will provide you with four identical pairs of test samples (eight test samples in total). You will be told the type/grade/composition of the material used in each pair. Two of the pairs of samples will be prepared from contrasting materials from within the same material group (e.g. Polymers: 2 x Polypropylene and 2 x Urea Formaldehyde) The remaining two pairs will be from contrasting materials from a different material group (e.g. Composites: 2 x GRP and 2 x CFRP). You will determine the mechanical properties of each of these test pieces by carrying out at least one type of destructive test and analysing the results. You could use test procedures from the following list: • Tensile test to determine limit of proportionality/elastic limit, yield point, tensile strength, Young's Modulus of Elasticity, percentage elongation and reduction in area. • Izod or Charpy impact test to determine impact energy absorbed, fracture surface percentage crystalline area (to establish if brittle or ductile

	fracture). • Creep test to determine creep rate. • Fatigue test to determine fatigue life at a specified load. **You need to:** • Safely set-up and carry out destructive test procedures on all eight material samples. • Record accurate test results and details of all testing activities in a log book. **Research into non-destructive testing** **To do this:** Your tutor will give you two non-destructive test procedures to investigate. **You need to:** • Research the function, operation and effectiveness of two non-destructive test procedures used to identify surface and sub-surface material defects. • Research the types of flaws these non-destructive test procedures are used to detect and their impact on the mechanical properties of non-metallic materials. **You then need to:** Produce an organised portfolio of evidence, which includes your log book, that contains: • Details of the destructive tests carried out on the eight test sample provided. • Raw test data obtained from the destructive tests • Mechanical properties of the samples, determined from test data and an explanation of how these were calculated. • A comparison of experimentally determined mechanical properties with reference values obtained from an accredited data source. • Observation records of practical testing activities that you carried out. • A discussion of how the mechanical properties of materials can affect their in-service behaviour. • An explanation of two non-destructive test procedures and the defects that they are able to detect. • An explanation of how the mechanical properties of materials are affected by internal or surface defects in the material structure. • An evaluation of the relationship between the mechanical properties of materials determined in destructive testing, the values for those properties taken from an accredited data source, defects in the material structure and the in-service behaviour for each of the materials tested.
Checklist of evidence	A portfolio containing a log book and written reports,

required	photographs, illustrations, tabulated numerical test data, calculations, referenced extracts from accredited data sources, observations records.
Criteria covered by this task:	
Unit/Criteria reference	To achieve the criteria you must show that you are able to:
26/B.D2	Evaluate, using the results from safely and accurately conducted destructive tests, an accredited data source and research, the relationship between the mechanical properties, in-service behaviour and defects of at least two contrasting materials from two non-metallic material groups.
26/B.M2	Conduct at least one destructive test(s), safely and accurately on at least two contrasting materials from two non-metallic material groups.
26/B.M3	Assess, using the test results and an accredited data source, how at least one mechanical property for each material type affects their in-service behaviour.
26/M.M4	4 Analyse the operation of at least two non-destructive test methods and how the mechanical properties of two contrasting materials from two non-metallic material groups are affected by defects.
26/B.P3	Conduct at least one destructive test(s) safely on at least two contrasting materials from two non-metallic material groups.
26/B.P4	Explain, using the test results, how at least one mechanical property for each material type affects their in-service behaviour.
26/B.P5	Explain the operation of at least two non-destructive test methods and how the mechanical properties of two contrasting materials from two non-metallic material groups are affected by defects.
Sources of information to support you with this Assignment	Books Materials for Engineers and Technicians 6th Edition; Bolton W, Higgins R A; Routledge, 2014; ISBN 978-1138778757 Websites matweb.com makeitfrom.com
Other assessment materials attached to this Assignment Brief	Prepared test specimens and details of their type, grade and or composition.